

Distributed Anemometry via High-Definition Fiber Optic Sensing, Phase I

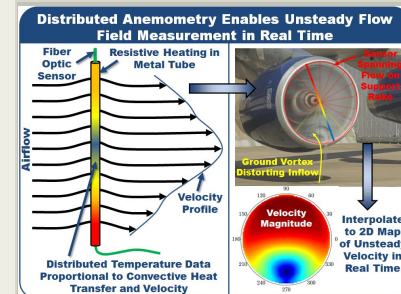
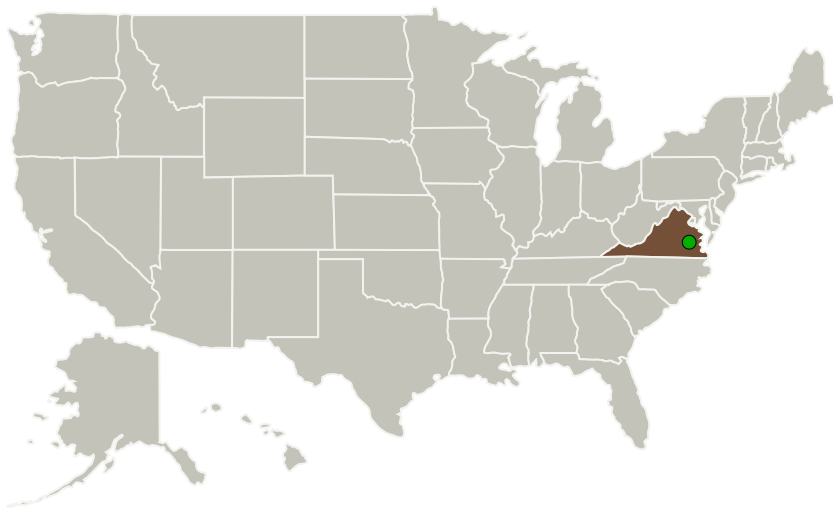
Completed Technology Project (2017 - 2017)



Project Introduction

Luna is developing a distributed anemometer that can directly measure flow field velocity profiles using high-definition fiber optic sensing (HD-FOS). The concept is inspired by hot-film anemometry, but extends the capability from a point measurement to a distributed measurement. With a spatial resolution of 1.25 mm, thousands of data points can be collected along an optical fiber to enable 1D, 2D or 3D field measurements, depending on the routing of the sensor. The benefits of this approach compared to particle image velocimetry (PIV) include: no seeding of the flow is necessary; the sensor can be used in non-line-of-sight locations; velocity and temperature profiles can simultaneously be acquired; and the technology can potentially be implemented in a flying vehicle. Measurements of boundary layer velocity and temperature profiles, transition location, and skin friction can be attained with this technique. Phase I will prove the feasibility of flow velocity measurement from a distributed fiber optic sensor over a range of temperatures and Mach numbers to quantify its accuracy. During Phase II, the technology will be matured for implementation in NASA wind tunnels and commercial jet engines. During Phase III, Luna will work with NASA and industry partners to commercialize the technology.

Primary U.S. Work Locations and Key Partners



Distributed Anemometry via High-Definition Fiber Optic Sensing, Phase I Briefing Chart Image

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Organizations Performing Work	Role	Type	Location
Luna Innovations, Inc.	Lead Organization	Industry	Roanoke, Virginia
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations

Virginia

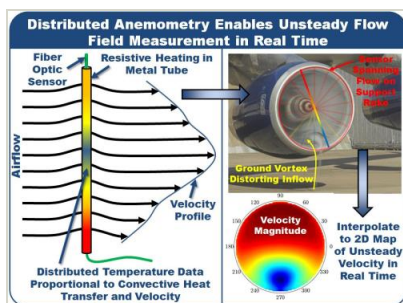
Project Transitions

**June 2017:** Project Start**December 2017:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140751>)

Images



Briefing Chart Image

Distributed Anemometry via High-Definition Fiber Optic Sensing,
Phase I Briefing Chart Image
(<https://techport.nasa.gov/image/128575>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Luna Innovations, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

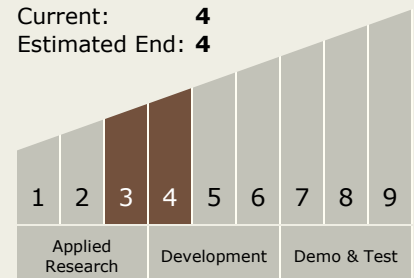
Carlos Torrez

Principal Investigator:

John Ohanian

Technology Maturity (TRL)

Start: 3
Current: 4
Estimated End: 4



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Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
 - └ TX09.4 Vehicle Systems
 - └ TX09.4.6 Instrumentation and Health Monitoring for EDL

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System